REMARKS

Status of claims

Claims 1 to 5 have been rejected as obvious based on an argued combination of five references: Rau et al. (U.S. Patent 4,162,908), Kao (U.S. Patent 4,243,298), Ohga et al. (U.S. Patent 5,474,589), Presby (U.S. Patent 4,307,296), and a segment of Encyclopedia Britannica. Dependent claims were also rejected based on the same five-reference prior-art combination, plus argued combination with Izawa (U.S. Patent 4,062,665) French (U.S. Patent 4,049,413) or Booth (U.S. Patent 5,168,541).

The non-elected claims, claims 6 to 10 have here been cancelled without prejudice to their re-assertion in a divisional application.

Claim 1

Claim 1as amended recites a method for producing a preform for optical fibers. A core glass cylinder with a longitudinal axis is provided, and a fluorine-doped SiO_2 cladding glass is produced on the core glass cylinder by rotating it about the longitudinal axis and feeding a plasma burner with a silicon-containing starter substance. The starter substance is oxidized in a plasma flame of the plasma burner to obtain SiO_2 particles, and the SiO_2 particles are deposited in layers on a cylindrical outer surface of the core glass cylinder in the presence of fluorine. The SiO_2 particles are sintered and deposited into the cladding glass, and the plasma flame emits ultraviolet light in one or more wavelengths of about 214 nm at an intensity of at least 0.9 μW,

determined on the basis of a plasma flame intensity measurement, during the forming and depositing of the SiO_2 particles on the core glass cylinder.

The method recited in claim 1 improves the quality of preforms made by a plasma-outside-deposition (POD) process that uses a plasma flame that emits UV wavelength of 214 nm. Where the plasma flame produces ultraviolet light of about a 214 nm wavelength at an intensity of at least 0.9 μW, it substantially reduces the number of defects in the core glass cylinder as compared with a process that produces 215 nm UV at substantially lower intensities.

This method and its benefits is not suggested by the prior art, and reconsideration of the rejection is therefore respectfully requested.

Rau describes a typical plasma outside deposition (POD) process of the prior art used in the production of synthetic quartz glass. Figures 1 and 2 of Rau illustrate the process, in which a burner 10 emits a plasma flame and deposits fluorine-doped synthetic quartz glass onto a quartz glass piece 19. See Rau, col. 3, lines 64 to 68. As the Examiner concedes, Rau says nothing about the wavelengths or intensity of the UV in the plasma flame. Rau therefore fails to suggest the claimed method with the specific UV wavelength or intensity.

Kao describes a chemical vapor deposition (CVD) technique, as opposed to a plasma-outside-deposition process, that produces optical preforms by sequential chemical deposition of various glass layers. See Kao, col. 2, lines 31 to 36. Kao also is silent as to the UV emission wavelengths or intensity of the plasma flame, and also fails to suggest the method recited in claim 1 or suggest the benefits of the claimed method.

Ohga teaches that certain quartz glass materials have vulnerabilities to damage by absorption of UV light of 215 nm. See Ohga, col. 2 lines 10 to 14. Ohga teaches that the

cause of the absorption is avoided by fluorine-doping. See col. 2 lines 45 to 60. A plasma burner may be used to make the fluorine-doped glass. See Example 5. Ohga also does not mention the wavelength or intensity of a plasma flame used to produce fluorine-doped quartz glass, and does not suggest the wavelength and intensity of ultraviolet light of the method of claim 1, and does not describe a method that confers the benefits of the method of claim 1.

Presby teaches a method for measuring the diameter of a doped core region of an optical fiber or preform by shining UV light of a wavelength that makes the dopant in the core region fluoresce. See Presby, col. 1, lines 34 to 36. The UV wavelength selected corresponds to the peak absorption wavelength for the dopant. Presby, See col. 2 lines 42 to 48.

The Presby method is used to measure the core diameter during optical fiber production. See Presby, col.1 lines 10 to 16. Presby does not teach a method for making preforms by any method, let alone a plasma deposition, and does not suggest a plasma flame with the recited ultraviolet wavelengths or intensity recited in claim 1.

The Encyclopedia Britannica is cited for the general principle that light intensity is related to the wavelength of the light. No specific light wavelengths or intensities are discussed, and this general concept has no impact on the patentability of claim 1.

Therefore the prior art fails to suggest a method as recited in claim 1, and none of the cited references offers the benefits of the claimed invention. Reconsideration of the rejection is respectfully requested.

Dependent claims 2 to 5 depend directly from claim 1 and distinguish therewith over the prior art.

New Independent Claim 11

This amendment adds new independent claim 11, which expresses the invention with a different formulation than claim 1.

Claim 11 recites a method for producing a preform for optical fibers. The method comprises providing a core glass cylinder having a longitudinal axis, and producing a fluorine-doped SiO_2 cladding glass on the core glass cylinder rotating about the longitudinal axis.

The producing includes feeding a plasma burner with a silicon-containing starter substance, the starter substance being oxidized in a plasma flame of the plasma burner so as to obtain SiO_2 particles, depositing the SiO_2 particles in layers on a cylindrical outer surface of the core glass cylinder in the presence of fluorine, and sintering the SiO_2 particles deposited into the cladding glass. During the forming and depositing of the SiO_2 particles on the core glass cylinder, the plasma flame emits UV radiation having a wavelength of 214 nm at an intensity such that the UV radiation of the cylindrical outer surface of the core glass cylinder produces a damage layer in an area of contact between the core glass cylinder and the layers of SiO_2 particles applied to the cylindrical outer surface. This damage layer blocks the passage of the UV radiation therethrough so that the core glass cylinder is shielded thereby from damaging effects of further UV radiation as the SiO_2 particles are formed in the plasma flame and deposited.

In the claimed method the damage layer protects the inner core glass cylinder from the UV radiation produced by the plasma flame while the fluorine-doped cladding glass is applied. None of the references cited suggest a method that makes such a damage layer.

Rao discusses simply a POD process, and neither identifies a problem of damage to the core glass by the UV radiation from a plasma flame, nor suggests a way to prevent it.

Kao describes a chemical vapor deposition (CVD) technique, as opposed to a plasma-outside-deposition process, and the issue of plasma flame UV damage to core glass does not arise, and neither the problem of a plasma process, nor a solution to that problem is suggested.

Ohga teaches only that fluorine-doping of quartz glass avoids damage by absorption of UV light of 215 nm. See Ohga, col. 2 lines 10 to 14. Ohga nowhere suggests that a damage layer might be created by UV light at 214 nm, or that the damage layer might protect quartz glass below it against further damage by the UV.

Presby teaches a method for measuring the diameter of a doped core region of an optical fiber. See Presby, col. 1, lines 34 to 36. Presby does not teach a method for making preforms by any method, let alone a plasma deposition, and does not identify even the problem of core glass damage, or the solution of a damage layer protecting the core glass layer.

The Encyclopedia Britannica expresses the relationship between wavelength and intensity, but does not mention plasma deposition processes, and therefore does not suggest the claimed improved plasma outer deposition process.

Claim 11 therefore distinguishes over the cited references.

New claims 12 to 16 depend directly or indirectly from new claim 11, and therefore distinguish therewith over the prior art.

All claims herein having been shown to distinguish over the prior art in structure, function and result, formal allowance is respectfully requested.

Should any questions arise, the Patent Office is invited to telephone attorney for applicants at 212-490-3285.

Respectfully submitted,

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